PROJECT PROGRESS REPORT

PREPARED FOR THE ALASKA ENERGY AUTHORITY BY
THE ALASKA CENTER FOR ENERGY AND POWER

PROJECT TITLE: *Round 1:* Emerging Energy Technology Fund – Data Collection

REPORTING PERIOD: 1rst Quarter 2017

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EETF Round 1 Projects

Project #003 – Alaska Division of Forestry, Biomass Reforestation

ACEP currently has a draft final report written but is awaiting additional information from the project before proceeding. In February, Val Barber with UAF Cooperative Extension indicated that she would be submitting a more complete version of her final report soon. We have not been informed of more recent updates from AEA or the project participants.

Project #006 – Arctic Sun, Arctic Thermal Shutters and Doors

This project has reached completion. ACEP has completed its final report with input from AEA and will be publishing it in glossy format in the spring of 2017.

Project #009 – Genesis – Ultra-Efficient Generators and Diesel-Electric Propulsion

This project was concluded at its current stage of development. ACEP has received additional data and awaits the final report.

Project #026 – Cold Climate Housing Research Center (CCHRC), Ground Source Heat Pump (GSHP)

The ground source heat pump at the Cold Climate Housing Research Center continues to function as intended. The ground temperatures at the depth of the heat pump ground loops are shown in Figure 1.

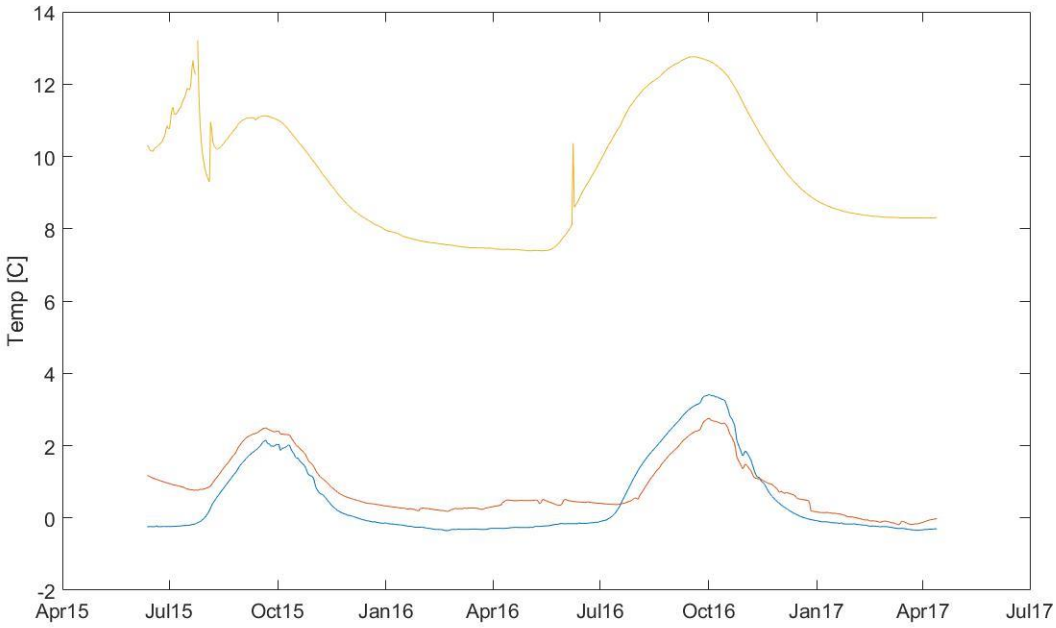

Figure 1. The ground temperatures at the depth of the heat pump ground loops indicate that winter temperatures are near freezing (0 °C). The west loop temperature sensor shown in yellow is reading erroneously high. The CCHRC has indicated that they intend to change out the sensor this summer if funding exists.

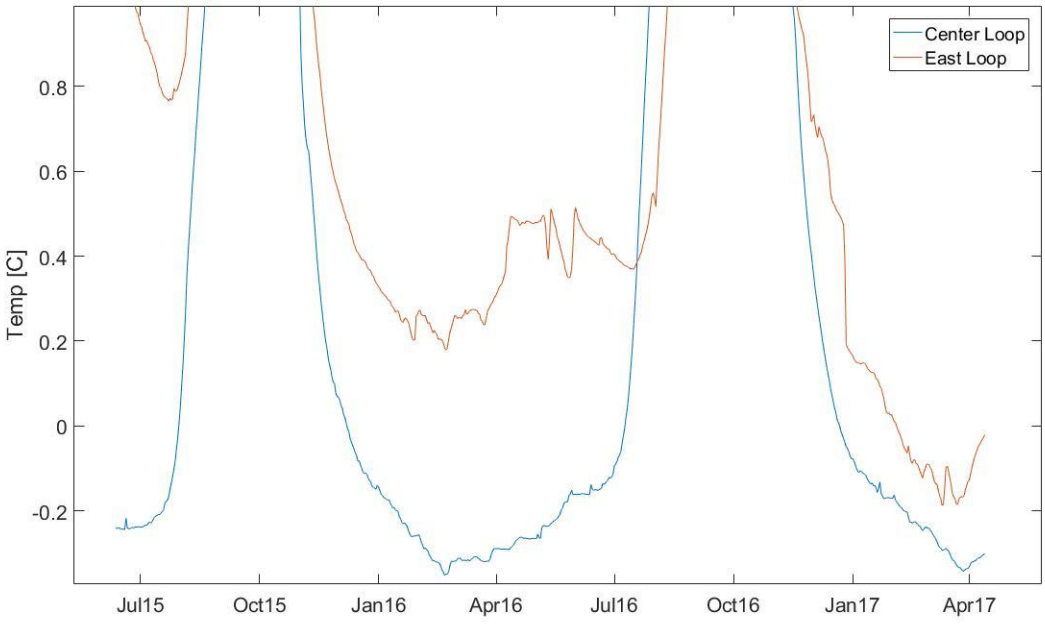

Figure 2. A zoomed in view of the east and west ground loop temperatures

The enlarged view of the east and west ground loop temperatures in Figure 2 shows that the ground reached a minimum temperature below freezing each spring time. One interesting point to note is that, in 2016, the minimum ground temperature was reached in early March, while it was reached at the end of March this year.

Figues 3 and 4 show electricity consumption and COP values of the heat pump.

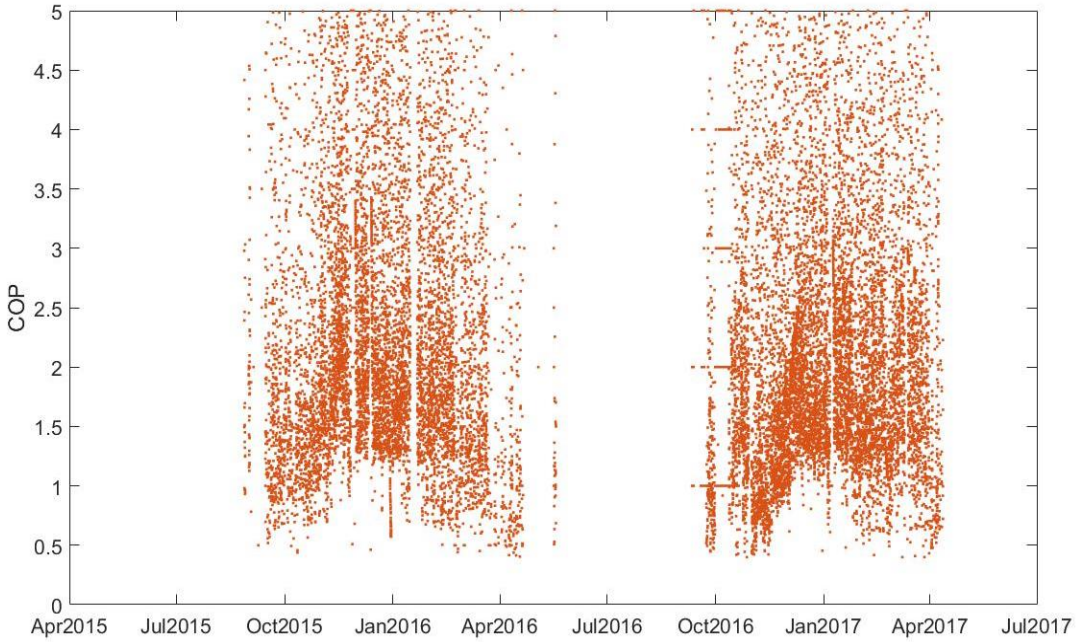

Figure 3. CCHRC GSHP COP values derived from 15 minute data

It appears that the COP values for this past winter were slightly lower and more concentrated around 1.5 or 2, whereas the COP values during the winter of 2015/ 2016 showed a greater spread. The average COP for the data shown is 2. These values correlate with the graph in Figure 4 that shows the electricity consumed by the heat pump. While the values from year to year appear similar, maximums are higher for the most recent winter.

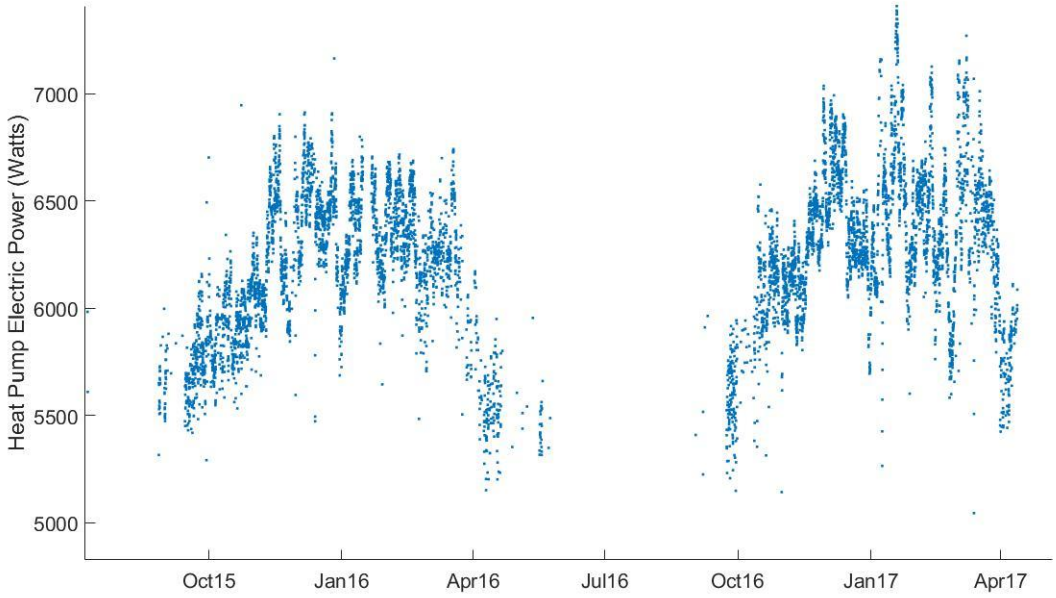

Figure 4. Hourly average heat pump electric power consumption.

Project #028 – University of Alaska Fairbanks (UAF), Organic Rankine Cycle (ORC)

Analysis is ongoing. ACEP will be issuing a draft of the final report in spring of 2017.

Project #029 – University of Alaska Fairbanks, Exhaust Thimble

This project has reached completion. ACEP has completed its final report with input from AEA and will be publishing it in glossy format in the spring of 2017.

Project #035 – Altaeros, Airborne Wind Turbine

According to its final report submitted to AEA, the Altaeros project team completed site selection, turbine design and testing, and initial safety and shakedown testing of the flight platform without the turbine. It should be noted that full load testing was not completed for the turbine, and the full-scale generator and power conditioning system were not built or tested. No data were transmitted to ACEP for analysis. ACEP will discuss with AEA next steps and final reporting obligations.

Project #037- Oceana, Hydrokinetics; Project #043 – Ocean Renewable Power Corporation (ORPC), Hydrokinetics; Project #058 – Boschma Research Inc. (BRI), Hydrokinetics

These projects have reached completion. ACEP has completed its final report with input from AEA and will be publishing it in glossy format in the spring of 2017.

Project #045 – Hatch, Flywheel

This project has reached completion. ACEP has completed its final report with input from AEA and will be publishing it in glossy format in the spring of 2017.

Project #049 – Intelligent Energy Systems (IES), Self-Regulated Grid; Project #051 – Intelligent Energy Systems (IES), Wind-Diesel-Battery Hybrid System

ACEP has received all data from IES and turned this data over to AEA. ACEP is currently in the final stages of completing a report draft for review.

Initial analysis by ACEP indicates:

- The mean wind speed when the system was in diesel off status was 23 mph. For the most part, the wind needed to be blowing >20 mph for diesel off operation.
- The mean production from wind during diesel off periods was 194 kW
- During the approximately 11 months of data that ACEP received, the system was diesel off for 76,047 minutes of the 458,974 minutes of data. These numbers correspond to 16% of the time.

ACEP has received all data from IES for the Tuntutuliak self-regulating grid project. We are in the early stages of data analysis and will be completing a final report draft for review in the coming months.

Project #061 – Marsh Creek, Various Speed Diesel-Electric Generation

ACEP has received final materials for this project and is working on a final report.

Additional Project – Northwest Arctic Borough, Arctic Field Testing and Power Curve Verification of Eocycle 25 kW Wind Turbine

ACEP did not receive any performance data during the first quarter of 2017. AEA has indicated that the NWAB shut down the turbine during the winter and plans to restart it this spring with the goal of completing a final report by June 30th.

Currently ACEP has data from May-November 2016 before the turbine was shut down because of icing concerns. Any additional data received by ACEP will be incorporated in our analysis.